SUPPLEMENT 3

SUMMARY OF THE CONDITION OF SOUTH FLORIDA WATER STORAGE AREAS IN THE 1974-75 DRY SEASON

Central and Southern Florida
Flood Control District

July 1975

SUMMARY OF THE CONDITIONS OF SOUTH FLORIDA WATER STORAGE AREAS IN THE 1974-75 DRY SEASON

Introduction

This is the third supplement to the original summary report for the 1970-71 dry season, characterized as one of the most severe seasonal dry periods experienced in South Florida, in which 1970-71 conditions were compared with those for 1971-72. The first and second supplements presented similar meteorologic and hydrologic data for the 1972-73 and 1973-74 dry seasons respectively.

Rainfall

Table 1 summarizes monthly rainfall data for the four reservoir areas. The monthly and seasonal (October-May) values are compared with long-term normals and departures from normal are also listed.

Over all the reservoir areas the seasonal rainfall was deficient when compared with the normal values. Rainfall was deficient in most months over all areas; markedly so in the month of October in which deficiences from over 3 inches to nearly 5 inches were experienced. May rainfall over all areas except the Central Everglades, however, was above normal which had not been the case in 3 of the 4 previous dry seasons (1971-72 being the exception).

Figures 1A through 1D plot the accumulated rainfall deficiencies over each of the four reservoir areas for the past five dry seasons. It will be noted that up through March-April accumulated deficiences over all areas were greater in 1974-75 than in 1970-71, much of this being accounted for by the more severely deficient rainfall in October 1974 than in October 1970. The

accumulated rainfall data show clearly that had it not been for the May rainfall surplus, the 1974-75 dry season would have been comparable to the 1970-71 "drought" in a meteorological sense.

The accumulated rainfall data comparisons also show rainfall deficiences of comparable severity in 3 of the past 5 dry seasons, strongly indicating that the 1970-71 condition was not unique from a meteorological standpoint.

Evaporation

Open pan evaporation data for Lake Okeechobee and at S-7 are listed in Table 2. Lake evaporation shows the highest seasonal value (40.12") for the past 5 seasons, being about 2½" greater than the 1970-71 and 1973-74 values and 5" greater than the long-term normal. On the other hand the S-7 value approximates the normal and is lower than the values for the preceding four seasons.

Table 3 relates the evaporation draft on Lake Okeechobee to the total draft. The 1974-75 values are compared with those of the previous four dry seasons in terms of the percentage of the total monthly draft which is represented by evaporation. As in 1970-71 the evaporation loss in no month represents less than about one-half the total monthly draft on Lake storage. The tabulation also reveals that during the more severely deficient dry seasons evaporation loss represents a smaller percentage of the total draft on the Lake because of heavier irrigation demands; the 1974-75 value of 60.9% comparing with 62.2% and 61.8% for 1973-74 and 1970-71 respectively.

Water Delivery and Use

Table 4 is a summary of the water deliveries to the service areas of all four reservoirs. Total estimated deliveries were about 174,000 A.F. greater

than in 1973-74 and about 279,000 A.F., greater than in 1970-71. The increase over 1973-74 is about 11.5%, and about 20% over 1970-71. For each reservoir the comparisons with 1970-71 are:

Reservoir	Volume (A.F.)	%
Lake Okeechobee	+ 158,000	+ 22%
C. A. #1	+ 49,000	+ 45%
C. A. #2A	+ 21,000	+ 19%
C. A. #3A	+ 21,000	+ 10%

The water delivery data for 1973-74 were considered to be comparable to those for 1970-71 and the 7% increase in 1973-74 deliveries was not felt to be necessarily indicative of an increased water demand (See Supplement 2). The 1974-75 data for the water conservation areas are quite comparable to those for 1973-74. However, the estimated increase in deliveries from Lake Okeechobee of about 120,000 A.F., over 1973-74 are considered to reflect an increased water demand in the Lake's service area.

The explanation for this increase does not appear to lie in a greater rainfall deficiency in the Lake area 1974-75 than in 1973-74. The bulk of the increase in deliveries occurred in February, March and April and rainfall deficiencies in these months were somewhat greater in 1974-75 than in 1973-74. Table 5 indicates that seasonal deliveries at the main Ag Area canals accounted for about 50,000 A.F., of the total 120,000 A.F. With approximately 460,000 A. under irrigation in the service areas of those canals, this increase represents only an additional application of 1.3"/A of supplemental water, which is considered reasonable.

The larger share of the total increase is due to the increase in deliveries to areas other than the Ag Area, principally the areas served by

the St. Lucie and Caloosahatchee. Some of this is due to the releases made for salinity control at the Franklin Lock and Dam. The remainder is, at this time not explainable, but is quite likely due to greater rainfall deficiencies in those areas.

Table 6 shows the deliveries from the water conservation areas. The values for Conservation Area No. 1 are almost precisely the same as for 1973-74 (159,000 A.F. to 163,000 A.F.). The values for Conservation Area No. 2A are about 15,000 A.F. higher than in 1973-74, this due to a higher seepage component in 1974-75 because of lower stages in the previous year resulting from the experimental drawdown. The values for Conservation Area No. 3A are about 65,000 A.F. higher than in 1973-74. Of this about 45,000 A.F., is accounted for by a larger seasonal delivery of water to Everglades National Park in 1974-75 (233,500 A.F. vs. 187,000 A.F.).

Figure 2 shows the total system mass water delivery curve for 1974-75 in comparison with those for the preceding four dry seasons. The groupings of the three "dry" dry seasons (1970-71, 1973-74, and 1974-75) and the two relatively normal dry seasons (1971-72 and 1972-73) is apparent. The difference between a more or less normal dry season and a rainfall deficient dry season represents approximately a half-million acre feet of water deliveries from system surface water storage.

Water Transfers to Lower East Coast

Surface water releases from reservoir storage to the lower east coast were, at most locations, initiated in February and terminated in mid-May. Releases at S-39 were started in mid-January and at S-31 in late March.

Complete data are not available at this time, but the following table lists the releases which were made at four of the five key control structures:

Location	Volume (A.F.)					
	Jan.	Feb.	March	April	May	Total
S-31	0	0	2,600	25,200	10,300	38,100
S-34	0	3,600	9,300	13,900	3,800	30,600
S-38	0	1,000	3,800	7,400	2,100	14,300
S-39	2,000	3,700	5,100	8,500	2,400	21,700
S-5A	(Not available)					

These partial data are comparable with that for 1973-74; except that the deliveries at S-31 to the Miami Springs-Hialeah well-field complex were about half the 1973-74 deliveries.

The City of West Palm Beach withdrawals from the L-8 canal to maintain water supply availability in its water catchment area are estimated at 65,000 A.F., for the period October through May.

It is estimated that in 1973-74 the deliveries from the Lake to the lower east coast area to meet supplemental water needs were on the order of 180,000 A.F. The partial data available at this time indicate that deliveries in 1974-75 were at approximately this same level.

Water Deliveries to the Lower West Coast

Starting on February 26, 1975, and continuing through until May 28, releases were made from Lake Okeechobee to maintain salinities upstream of the Franklin Lock and Dam on the Caloosahatchee River at the City of Ft. Myers and Lee County potable water supply intakes, at values below the PHS standard of 250 mg/l. It is estimated that approximately 40,000 A.F.,was released from the Lake in order to maintain the Class I character of the Caloosahatchee River above S-79 with respect to chlorides concentrations.

Reservoir Inflow

Table 7 lists data on surface runoff at selected inflow locations into each of the four reservoir areas.

Kissimmee River inflow into the Lake approximated that of 1970-71 and 1973-74, being 69% of the 1964-74 average. The departure from normal was 452,000 A.F., or about one foot of stage on the Lake.

Inflows from the Taylor Creek, Nubbin Slough, Mosquito Creek watersheds were somewhat below normal and Fisheating Creek inflows were, for all practical purposes, almost negligible. The reduction in flows from Fisheating Creek was noted in Supplement 2 and this phenomenon is being investigated.

Inflows from the Agricultural Area into Conservation Area No. 1 were somewhat greater than in 1973-74 but less at S-5A than in 1970-71.

Inflows to Conservation Area No. 2A at S-7 were smaller than in either of the two earlier "dry" dry seasons.

Inflows to Conservation Area No. 3A were near normal at both S-8 (from the Ag Area) and S-9 (from western Broward County), and were greater than in 1973-74.

Figure 3 is a set of bar graphs, for each reservoir, showing the proportion of total inflow contributed by direct rainfall and by runoff. The narrow range of monthly total inflow amounts to all three water conservation areas noted in 1973-74 (see Supplement 2) is again evident in these graphs. This is another measure of the uniformity of rainfall deficiency conditions over the region.

The data for Lake Okeechobee is particularly worthy of note. In every month but two, rainfall represented 70% or more of the total input to the Lake. In the two exceptions, rainfall represented about 40% of the total input. In contrast, in 1973-74 rainfall represented 52% or less of the total in 4 months and over 70% of the total in only two months. A comparison with 1970-71 shows similar characteristics. These comparisons demonstrate that available storage in the Lake in 1974-75 was much more heavily dependent on direct rainfall over the Lake than in either of the two previous "dry" dry seasons examined.

Storage-Demand

Figures 4 through 8 are curves showing the relationship throughout the dry season between available storage and the estimated maximum demand; the "beneficial use" portion of the total demand being based on demand during the 1970-71 drought.

The curves for Lake Okeechobee (Figure 5) show the relatively favorable position of storage availability in the Lake in 1974-75 as compared with either 1970-71 or 1973-74 when meteorlogical conditions were similar. Starting stage on October 1 was considerably higher in 1974-75 than in either of the other two dry seasons and, in addition, the May rains prevented a recession to levels approximating those of 1973-74.

Supply conditions in Conservation Area No. 1 were somewhat less favorable than in 1973-74, but nevertheless reasonably approximated the 1963-72 average.

In Conservation Area No. 2A the explanation for higher stages and water supply levels lies in the fact that experimental drawdowns had been conducted during the 1972-73 and 1973-74 dry seasons.

Figure 8 reveals that the stage and water supply conditions in Conservation Area No. 3A were almost precisely the same in 1974-75 as in both the 1970-71 and 1973-74 dry seasons.

Lake Okeechobee Water Balance, October 1974-May 1975

The water balance equation is:

$$\Delta s = P+I-O-E$$

where: Δs = change in storage
P = direct rainfall
I = tributary inflow
O = outflow
E = losses

For Lake Okeechobee the values for the above are:

Δs = (-) 1,491,000 A.F. ; (from Figure 5)*
$P+I$ = 709,000 A.F. ; (from Figure 3)
O = 893,000 A.F. ; (from Table 5)
E = 1,393,000 A.F. ; (from Table 3)

*Observed change in storage.

The water balance, in A.F., is:

$$-1,491,000 = 709,000 - 893,000 - 1,393,000$$

$$= -1,517,000$$

The computed storage change (-1,517,000 A.F.) is 26,000 A.F., greater than the observed change in storage. The imbalance is only 1.7% of the observed change, and the water balance is considered to be excellent.

It is to be noted that the observed change in storage in the 1974-75 dry season (-1,491,000 A.F.), is comparable with that of the 1973-74 dry season (-1,580,000 A.F.). This is another indication of the similarity of meteorological and hydrological conditions in the past two dry seasons.

TABLE 1

SUMMARY OF RAINFALL DATA (INCHES)

MONTH	LAKE OKEECHOBEE			N. EVERGLADES			C. EVERGLADES			S. EVERGLADES		
	NORMAL	1974-75	DEP	NORMAL	1974-75	DEP	NORMAL	1974-75	DEP	NORMAL	1974-75	DEP
OCTOBER	4.16	1.05	-3.11	4.88	0.48	-4.04	5.65	0.68	-4.97	6.68	1.78	-4.90
NOVEMBER	1.12	1.47	+0.35	1.50	1.32	-0.18	1.75	1.76	+0.01	1.80	3.60	+1.80
DECEMBER	1.16	1.05	-0.11	1.55	1.62	+0.07	1.50	0.53	-0.97	1.12	1.26	+0.14
JANUARY	1.09	0.36	-0.73	1.62	0.23	-1.39	1.67	0.06	-1.61	1.57	0.42	-1.15
FEBRUARY	1.84	1.96	+0.12	1.68	0.55	-1.13	1.64	0.75	-0.89	1.71	2.88	+1.17
MARCH	2.26	1.01	-1.25	2.61	1.77	-0.84	2.21	0.51	-1.70	1.90	0.26	-1.54
APRIL	2.75	1.14	-1.61	2.12	1.46	-0.66	2.71	2.83	+0.12	2.63	0.38	-2.25
MAY	3.87	6.12	+2.25	4.71	7.01	-2.30	4.97	6.64	+1.67	5.87	8.88	+3.01
TOTAL	18.25	14.16	-4.09	20.67	14.44	-6.23	22.10	13.76	-8.34	23.28	19.46	-3.82

TABLE 2

MONTHLY EVAPORATION - LAKE OKEECHOBEE AND S-7 (INCHES)

MONTH	LAKE OKEECHOBEE NORMAL	1974-75	DEP	S-7 NORMAL	1974-75	DEP
OCTOBER	4.50	5.79	+1.29	3.35	4.14	+0.79
NOVEMBER	3.70	4.00	+0.30	3.16	3.08	-0.08
DECEMBER	3.00	2.76	-0.24	2.67	2.10	-0.57
JANUARY	3.00	3.52	+0.52	2.51	2.96	+0.45
FEBRUARY	3.60	4.02	+0.42	3.06	3.06	0.0
MARCH	5.00	5.86	+0.86	4.70	4.95	+0.25
APRIL	5.70	7.23	+1.53	5.80	6.20	+0.40
MAY	6.30	6.94	+0.64	5.20	4.14	-1.06
TOTAL	34.80	40.12	+5.32	30.45	30.63	+0.18

TABLE 3

LAKE OKEECHOBEE - RELATION OF EVAPORATION TO TOTAL DRAFT

MONTH	Q(AF)	EVAPORATION 1974-75 INCHES	EVAPORATION 1974-75 AF	TOTAL DRAFT 1974-75 AF	EVAPORATION DRAFT % 1974 1975	1973 1974	1972 1973	1971 1972	1970 1971
OCTOBER	33644	5.79	217183	250827	86.6	83.3	66.7	91.0	80.7
NOVEMBER	115202	4.00	149360	264562	56.4	53.5	66.6	77.9	53.3
DECEMBER	50047	2.76	102511	152558	67.2	41.9	73.0	67.9	49.2
JANUARY	69755	3.52	129947	199702	65.1	83.8	75.4	67.4	53.7
FEBRUARY	103295	4.02	146060	249355	58.6	68.8	87.1	76.5	71.0
MARCH	173546	5.86	203635	377181	54.0	63.9	77.3	70.4	63.9
APRIL	233235	7.32	231962	465197	49.9	55.9	62.4	79.2	56.6
MAY	113847	6.94	211959	325806	65.0	54.2	62.0	91.5	65.9

TABLE 4

SUMMARY OF WATER DELIVERY - OCTOBER 1974 THROUGH MAY 1975

MONTH	LAKE OKEECHOBEE	CONSERVATION AREA 1	CONSERVATION AREA 2A	CONSERVATION AREA 3A	EVERGLADES NATIONAL PARK	MONTHLY TOTAL
OCTOBER	33644	18701	14142	44886	82910	194283
NOVEMBER	115202	18210	11900	35702	63870	244884
DECEMBER	50047	20190	11067	33203	44730	159237
JANUARY	69755	21328	12297	27670	20440	151490
FEBRUARY	103295	21812	15196	20549	8780	169632
MARCH	173546	24779	22966	19676	8900	249867
APRIL	233235	24031	30225	35805	1830	325126
MAY	113847	9948	13943	24307	2066	164111
TOTAL	892571	158999	131736	241798	233526	1658630

TABLE 5

LAKE OKEECHOBEE SERVICE AREA DEMAND (ACRE-FEET)

MONTH	LAKE SHORE AREA	HGS-3	HGS-4	HGS-5	ST. LUCIE & CALOOSAHATCHEE	MARTIN CO. IRRIGATION	MONTHLY DEMAND
1974							
OCTOBER	357	3785	10540	8132	1212	9618	33644
NOVEMBER	6831	21362	40239	27940	11223	7607	115202
DECEMBER	2938	8595	15410	11879	3295	7930	50047
1975							
JANUARY	4783	11580	22429	0	23209	7754	69755
FEBRUARY	8613	32289	27293	18530	9196	7375	103295
MARCH	3063	36705	62772	28453	32883	9670	173546
APRIL	11200	66759	76424	36048	31702	11102	233235
MAY	4405	32476	34213	7379	26676	8698	113847
TOTAL	42190	213551	289320	138361	139396	69754	892571

TABLE 6

DEMAND OF CONSERVATION AREAS (ACRE-FEET)

MONTH	CONSERVATION AREA 1			CONSERVATION AREA 2A			CONSERVATION AREA 3A				MONTHLY TOTAL
	S-39 & LWDD	SEEPAGE	SUB TOTAL	S-34 & S-38	SEEPAGE	SUB TOTAL	S-51	SEEPAGE	EVERG NAT'L PARK	SUB TOTAL	
1974											
OCTOBER	0	18701	18701	0	14142	14142	0	44886	82910	127796	160639
NOVEMBER	854	17356	18210	0	11900	11900	0	35702	63870	99572	129682
DECEMBER	1388	18802	20190	0	11067	11067	0	33203	44730	77933	109190
1975											
JANUARY	3500	17828	21328	0	12297	12297	0	27670	20440	48110	81735
FEBRUARY	7308	14504	21812	4644	10552	15196	0	20549	8780	29329	66337
MARCH	10761	14018	24779	13128	9838	22966	0	19676	8900	28576	76321
APRIL	15980	8051	24031	21300	8925	30225	17954	17851	1830	37635	91891
MAY	4940	5008	9948	5950	7993	13943	8320	15987	2066	26373	50264
TOTAL	44731	114268	158999	45022	86714	131736	26274	215524	233526	475324	766059

TABLE 7

SELECTED INFLOW DATA - OCTOBER THROUGH MAY

STATION	AVERAGE DISCHARGE OCT - MAY (ACRE-FT)	DISCHARGE OCT. 72 THRU MAY 73 TOTAL (ACRE-FT)	DEP. FROM NORMAL ACRE-FT	%
LAKE OKEECHOBEE				
Kissimmee River	654,660 (1964-74)	202,818	-451,840	-69.0
Taylor Creek	30,098 *	25,210	-4,888	-16.2
Fisheating Creek	73,395 (1956-74)	5,560	-67,835	-92.4
* Now takes in flow from Nubbins Slough, Mosquito Creek, etc.				
CONSERVATION AREA 1				
S-5A	120,200 (1958-74)	45,345	-74,855	-62.3
S-6	67,970 (1960-74)	21,560	-46,410	-68.3
CONSERVATION AREA 2A				
S-7	71,070 (1961-74)	19,085	-51.985	-73.1
CONSERVATION AREA 3A				
S-8	95,700 (1962-74)	92,780	-2,920	-3.0
S-9	53,050 (1958-74)	52,670	-380	-0.7

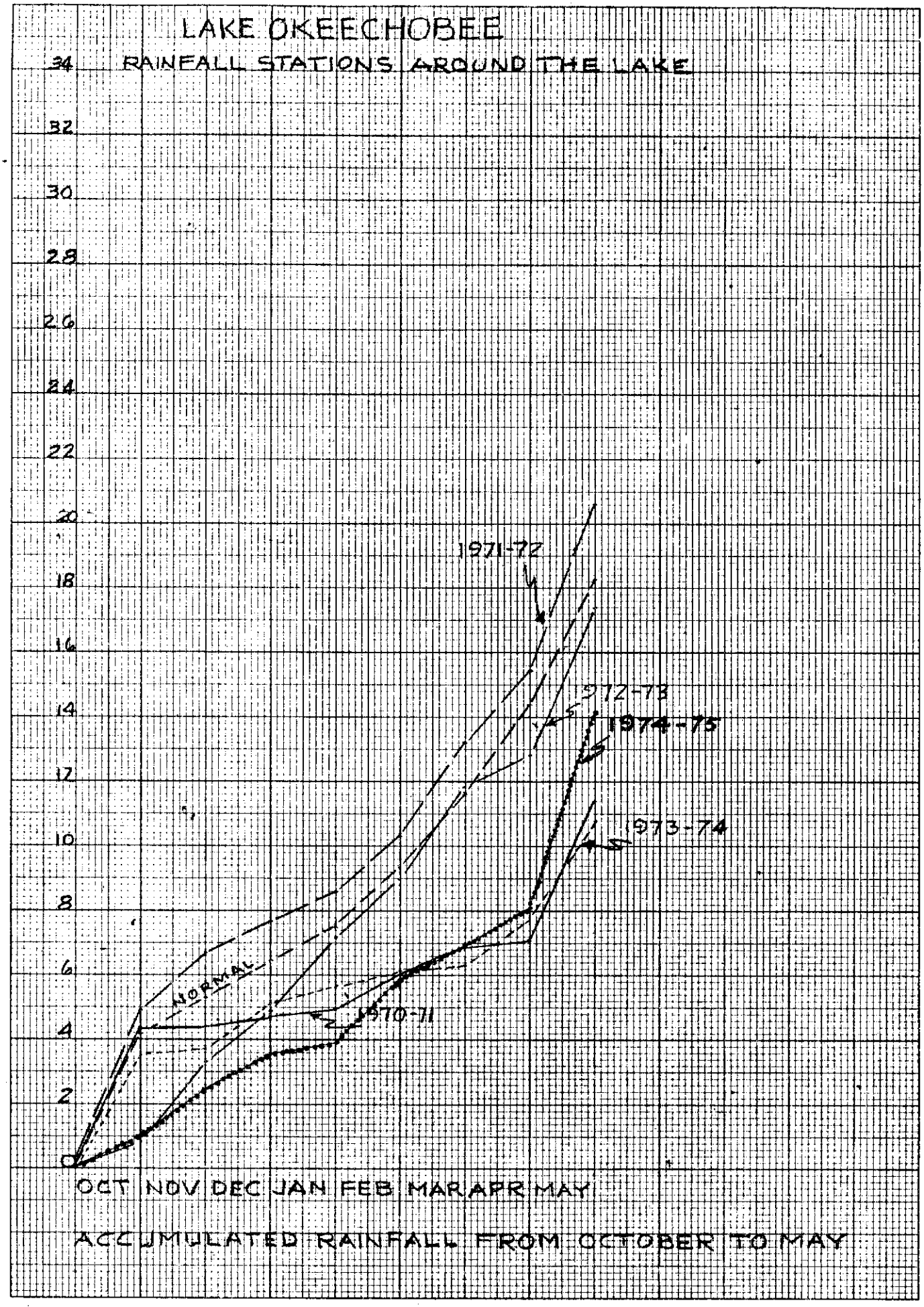

FIGURE 1A

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20 X 20 PER INCH

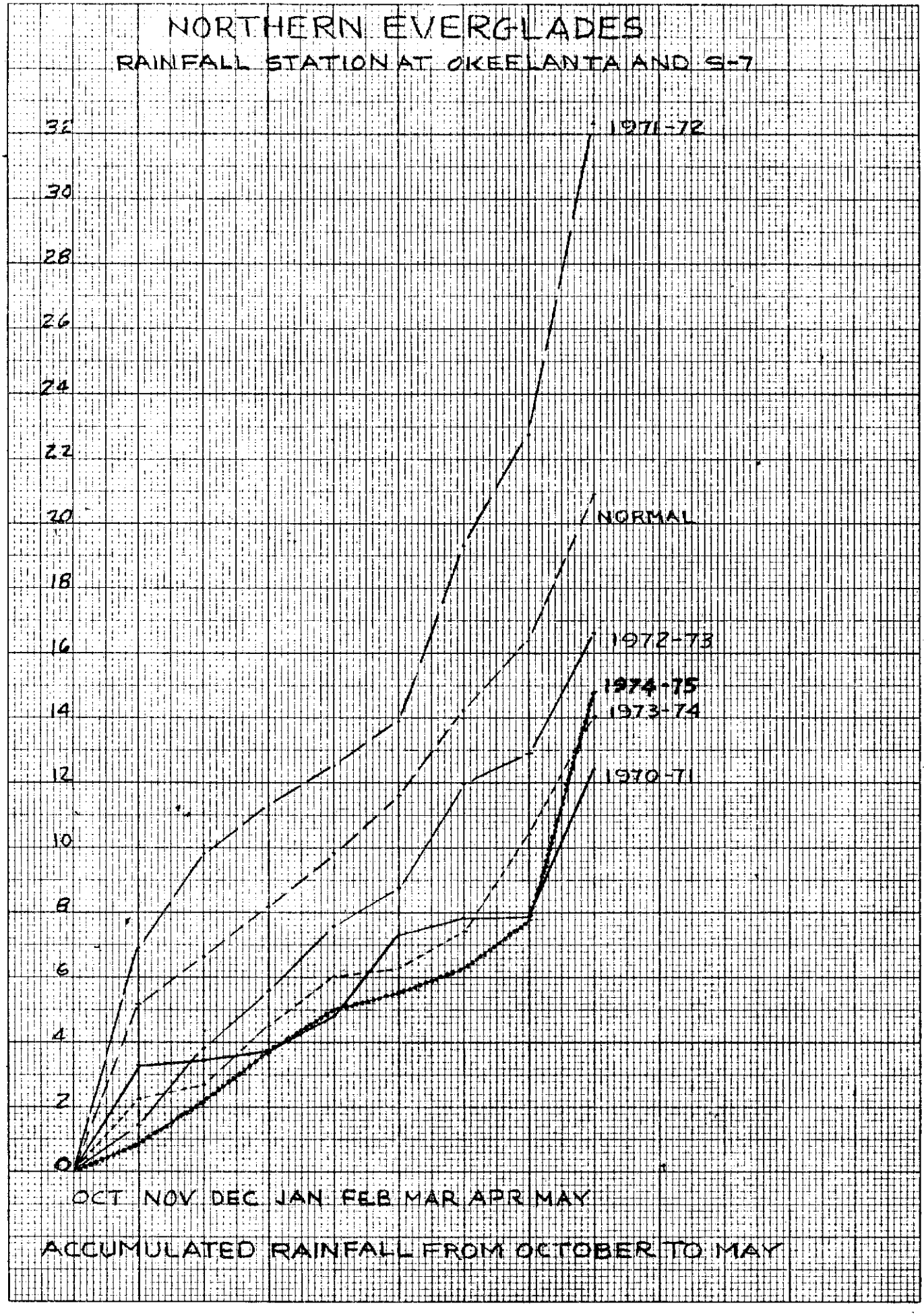

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FIGURE 1B

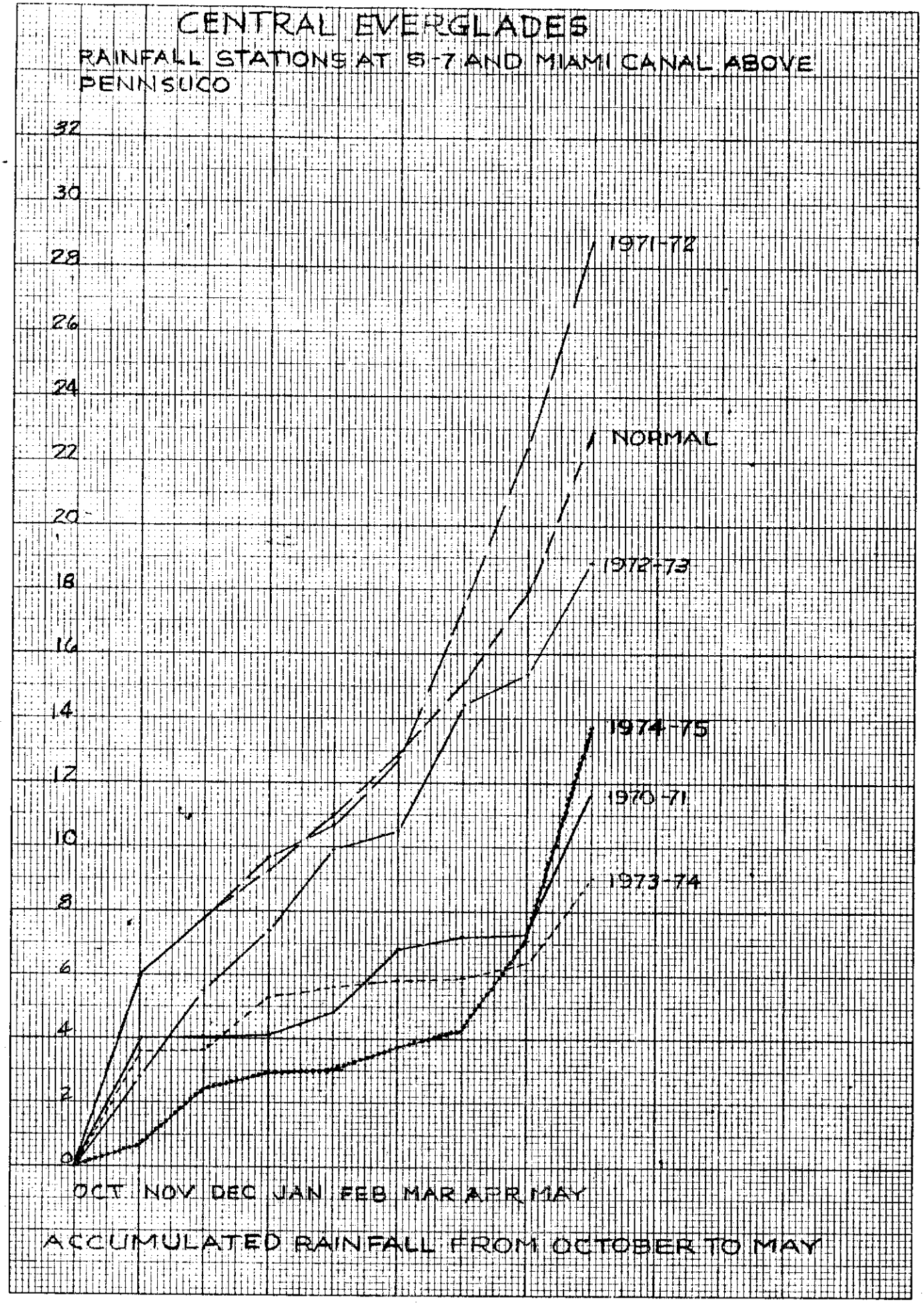

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FIGURE 1C

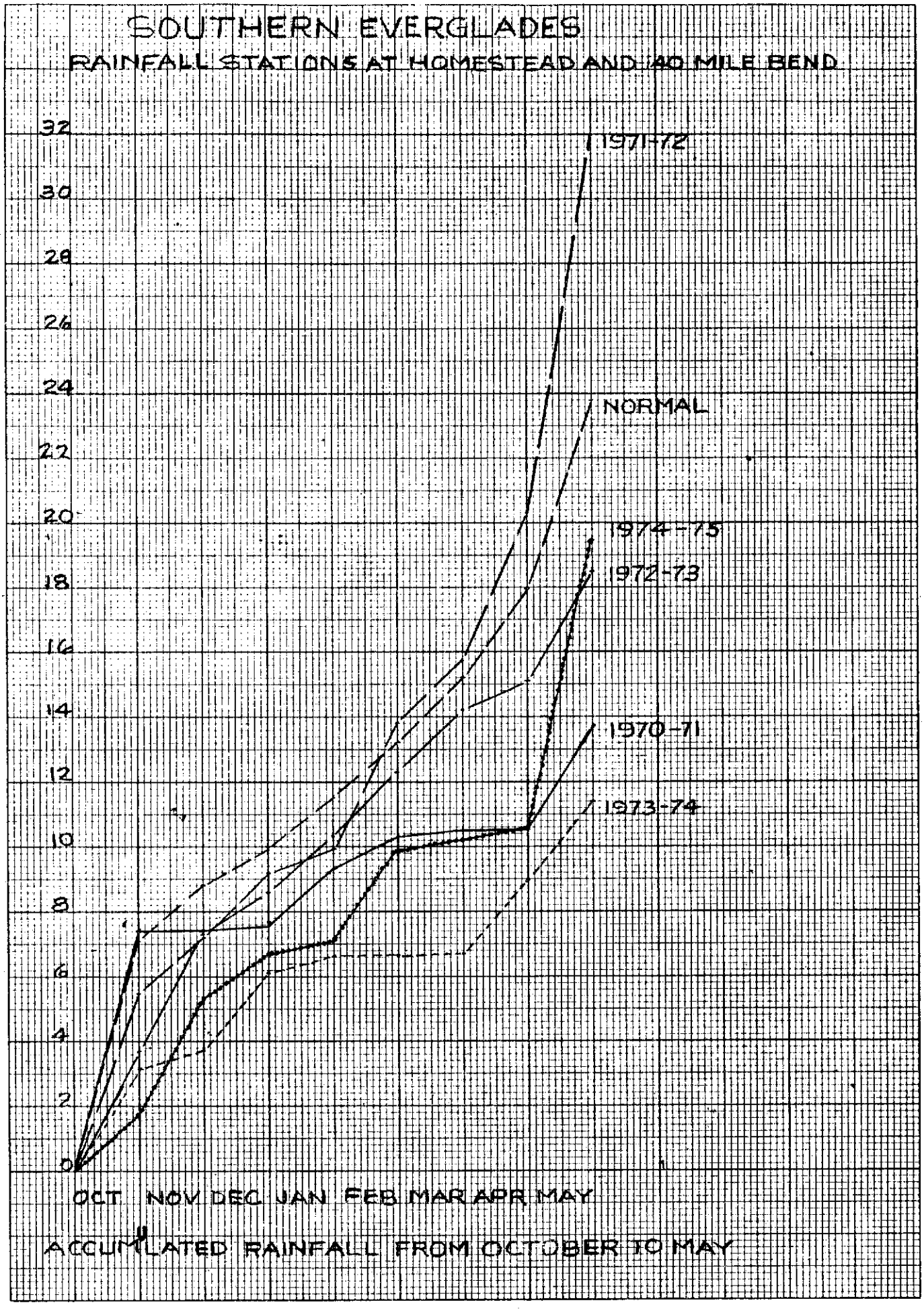

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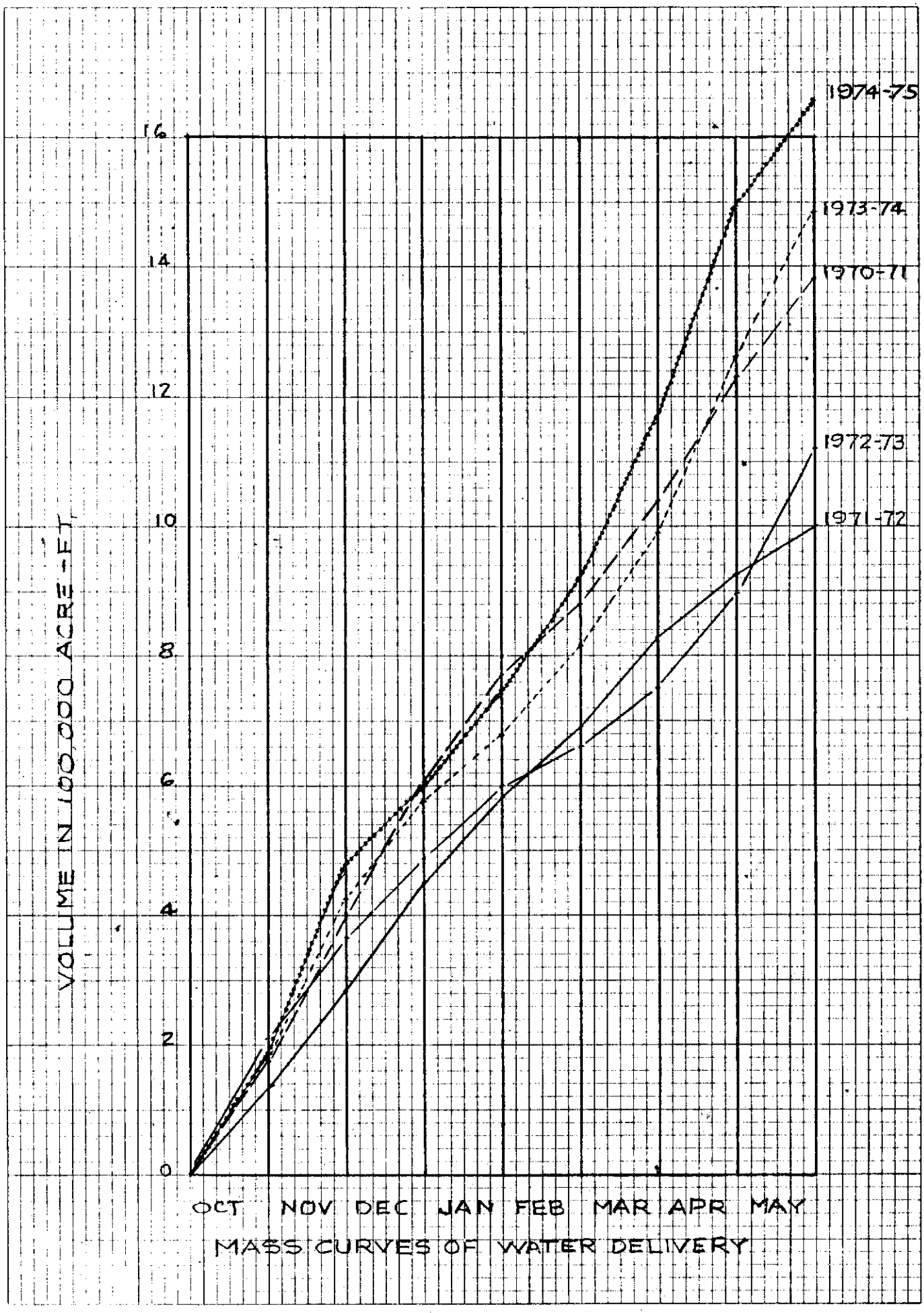
FIGURE 1D



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10 X 10 PER INCH

FIGURE 2

NO. 340-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

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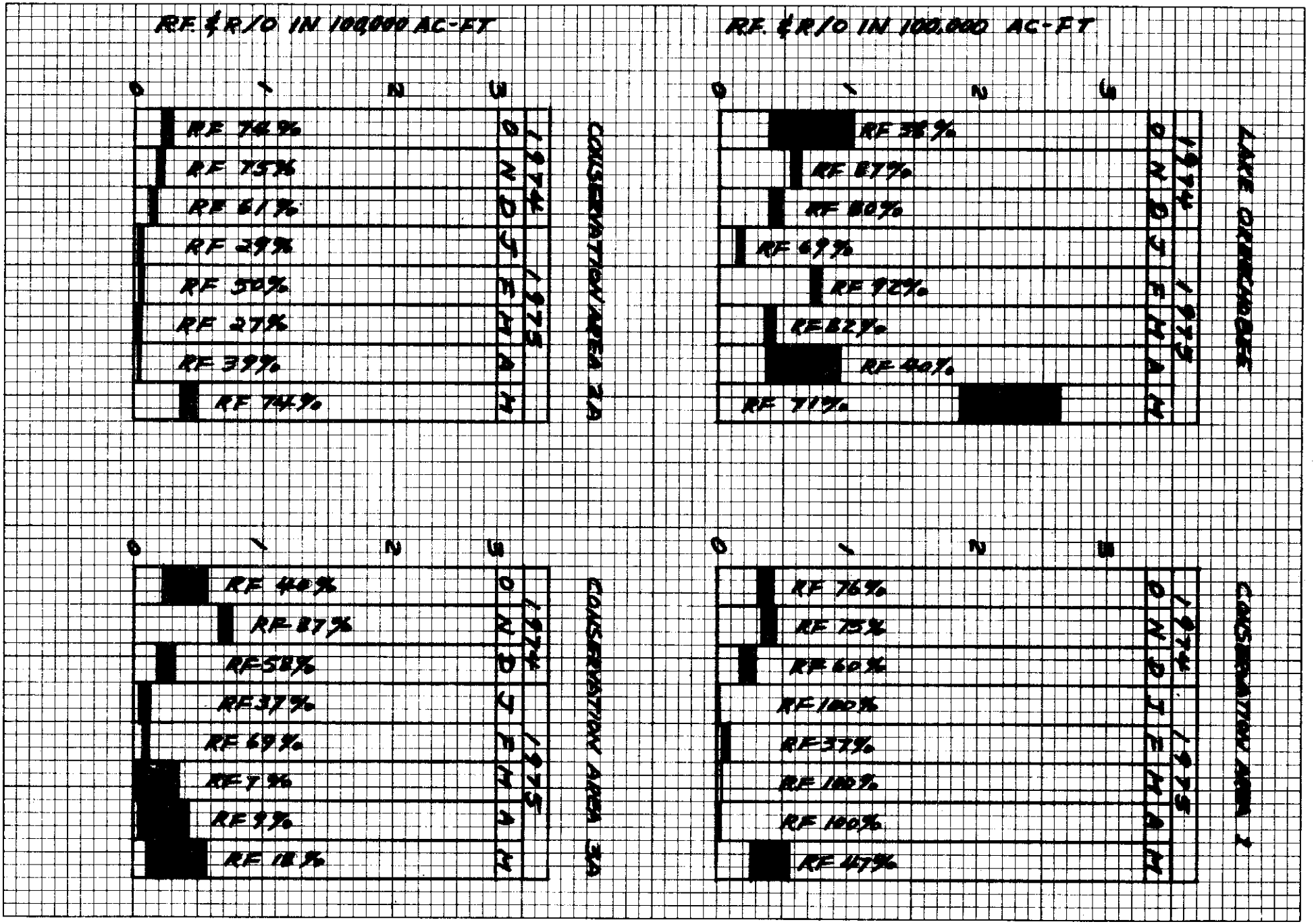
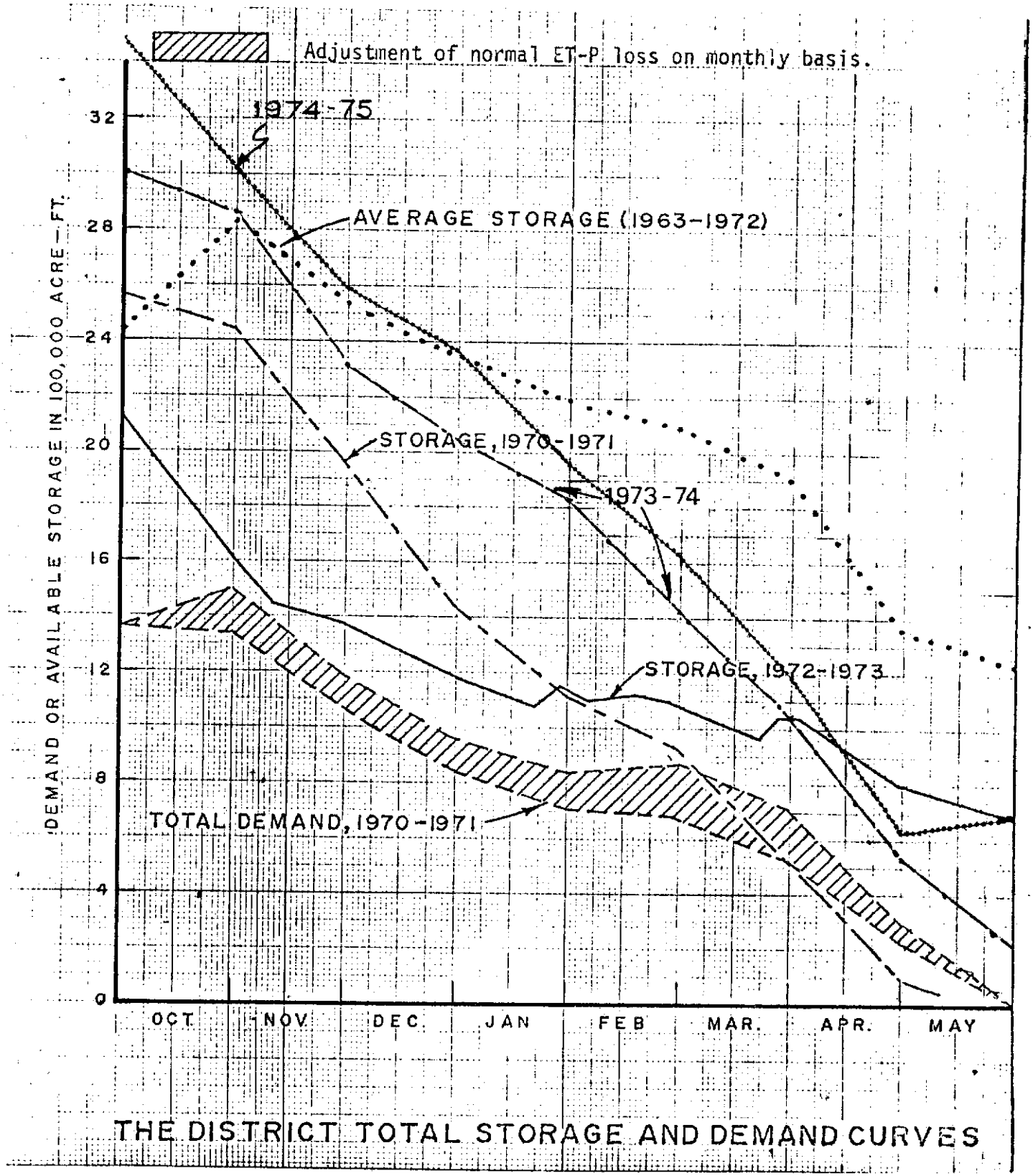
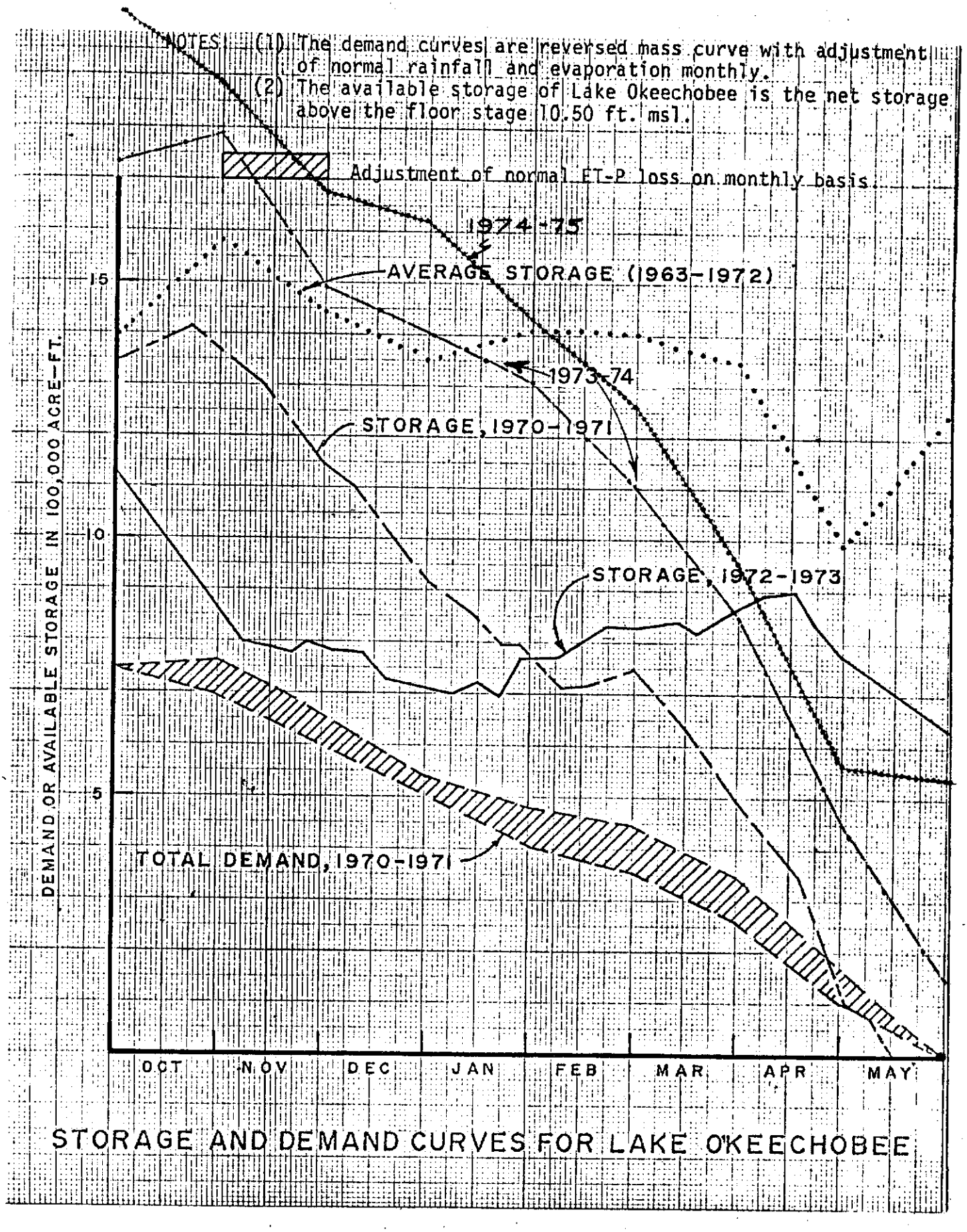
MADE IN U. S. A.





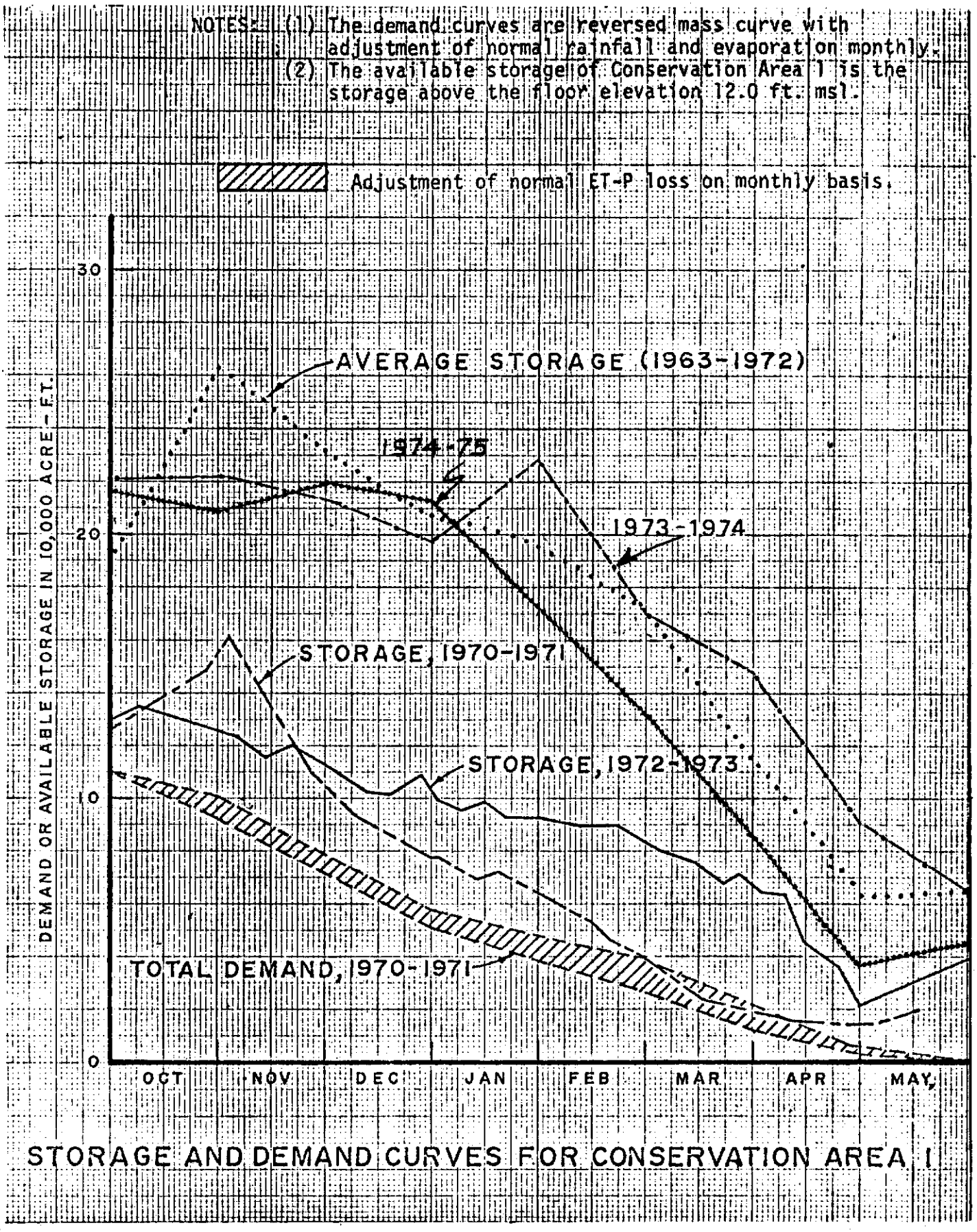
THE DISTRICT TOTAL STORAGE AND DEMAND CURVES

FIGURE 4



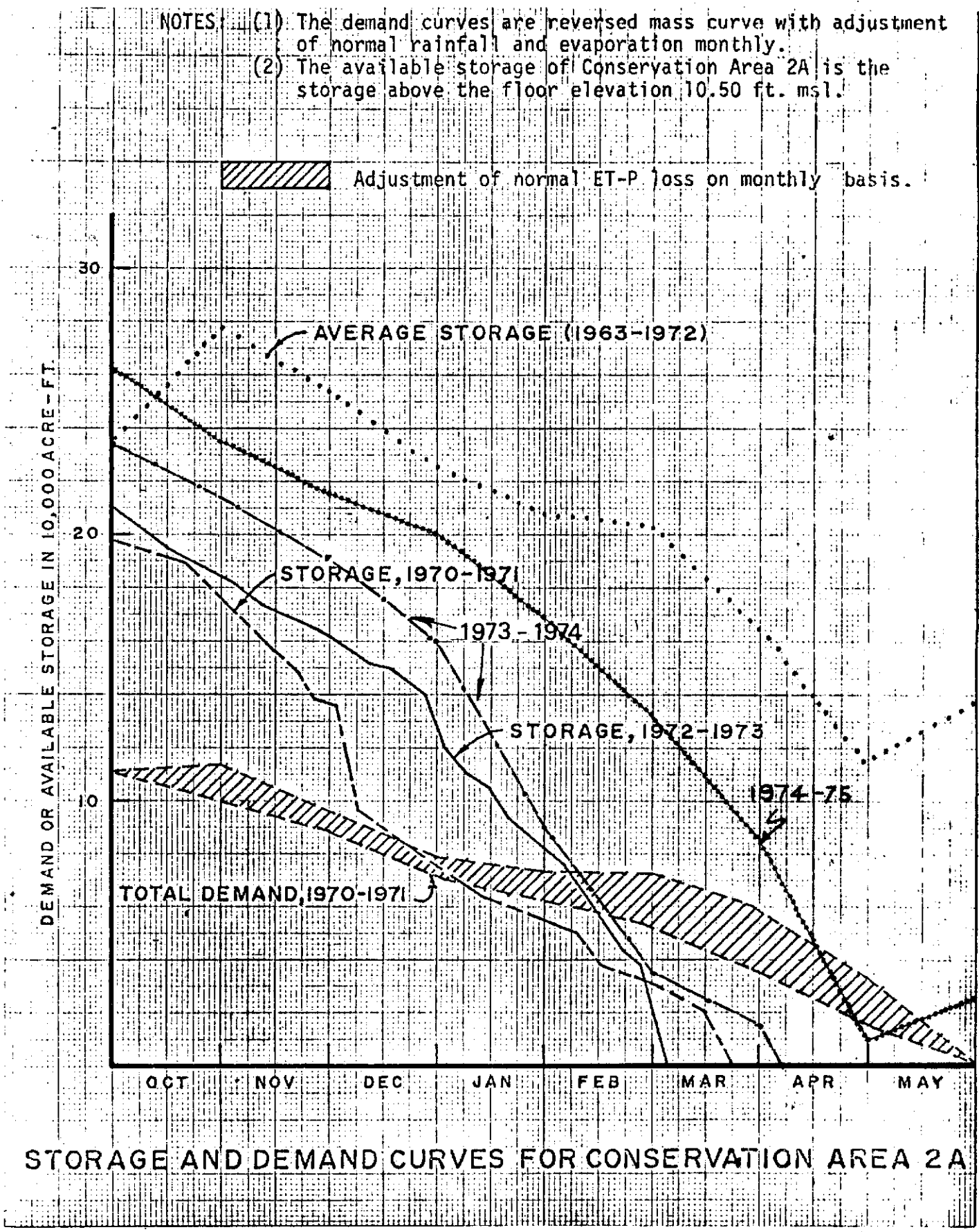
STORAGE AND DEMAND CURVES FOR LAKE OKEECHOBEE

FIGURE 5



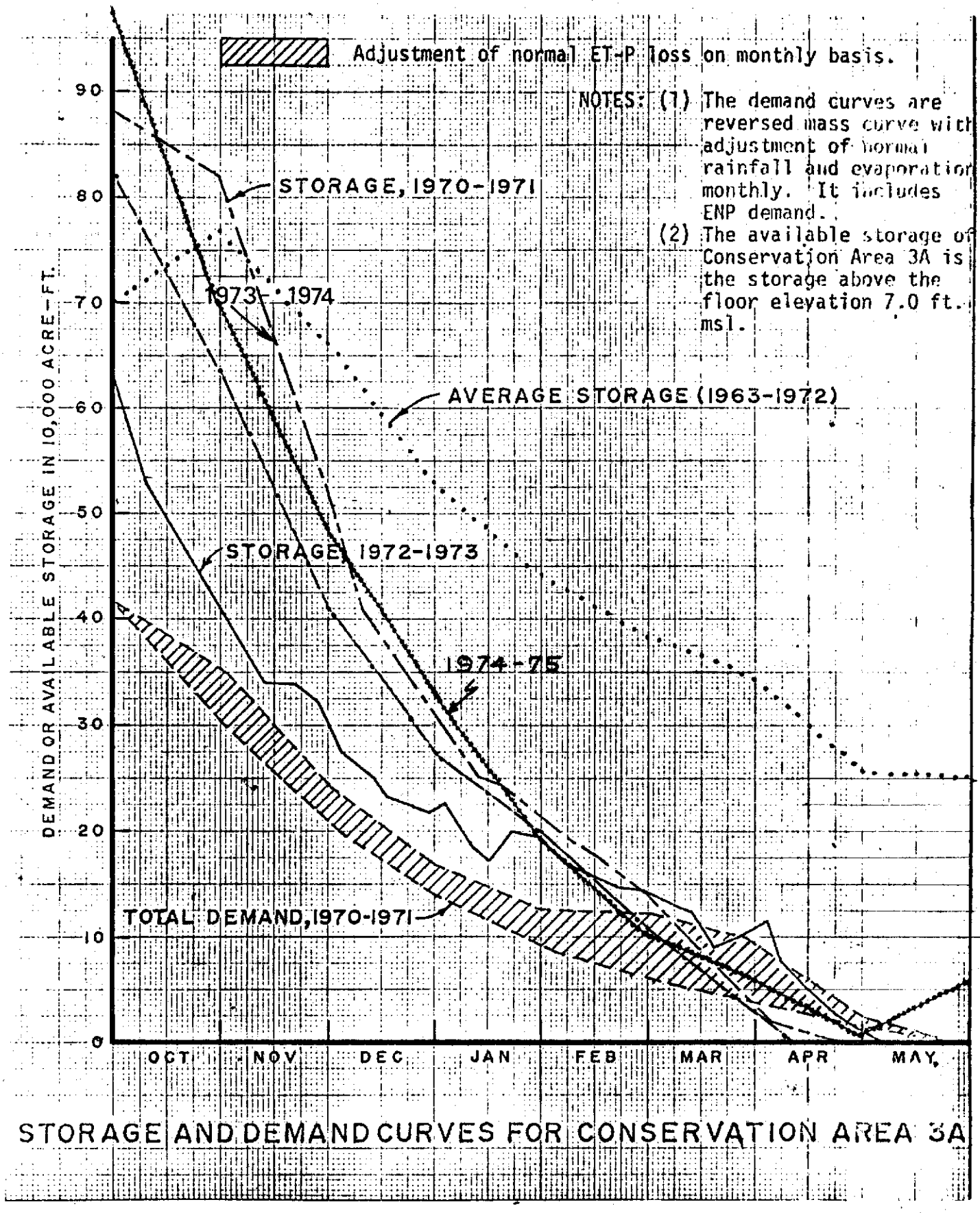
STORAGE AND DEMAND CURVES FOR CONSERVATION AREA 1

FIGURE 6



STORAGE AND DEMAND CURVES FOR CONSERVATION AREA 2A

FIGURE 7



STORAGE AND DEMAND CURVES FOR CONSERVATION AREA 3A

FIGURE 8